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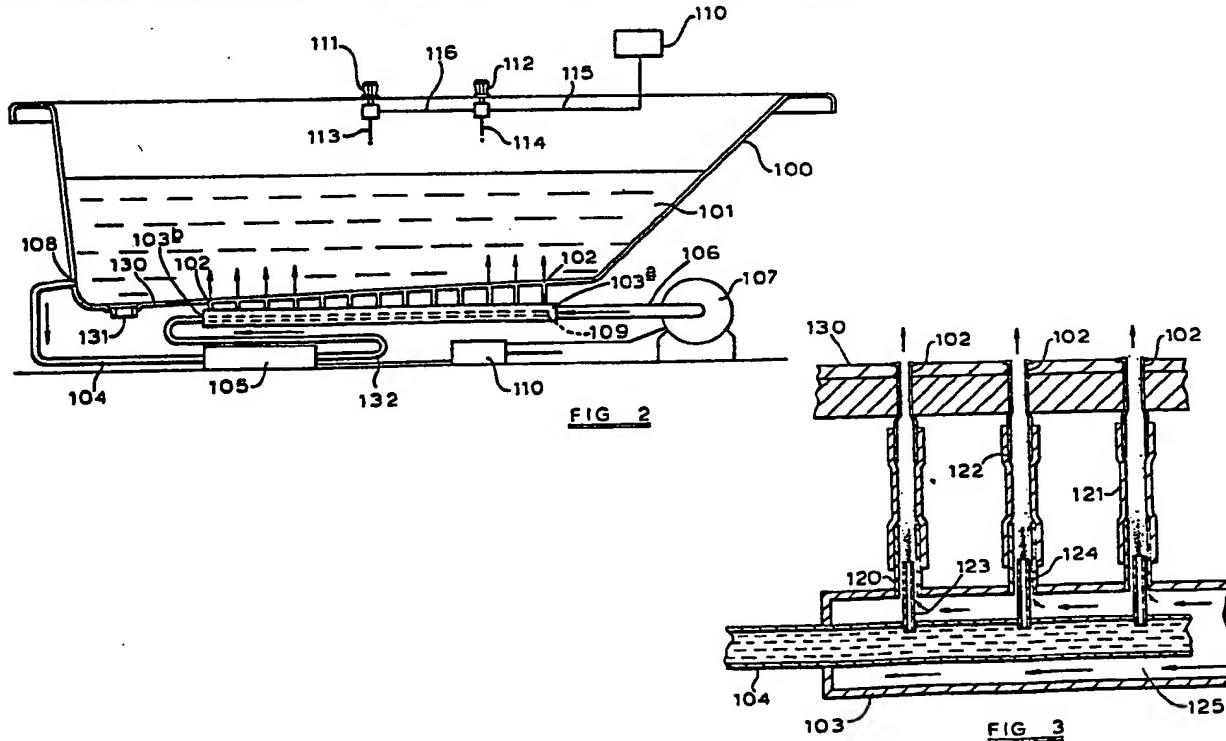
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(54) Spa baths

(57) In a spa bath 100 in which an air/water mixture is injected via injectors 102 into water 101, water is taken from outlet 108 at the bottom of the bath, heated in heater 105 and the heated water is supplied to jets 123 within manifold 103 through which compressed air is blown, the arrangement being such that passage of air through venturi gaps 124 causes water to be sucked through the jets to form fine droplets which are then discharged through the injectors. A recirculating pump may be located between outlet 108 and the heater. The latter may comprise heating element, pressure/flow switch, thermal cut-out, and thermostat. The droplets of heated water humidify and heat the air before the air/water mixture is injected into the bath, thereby reducing discomfort to the user and maintaining the water temperature in the bath at a desired level.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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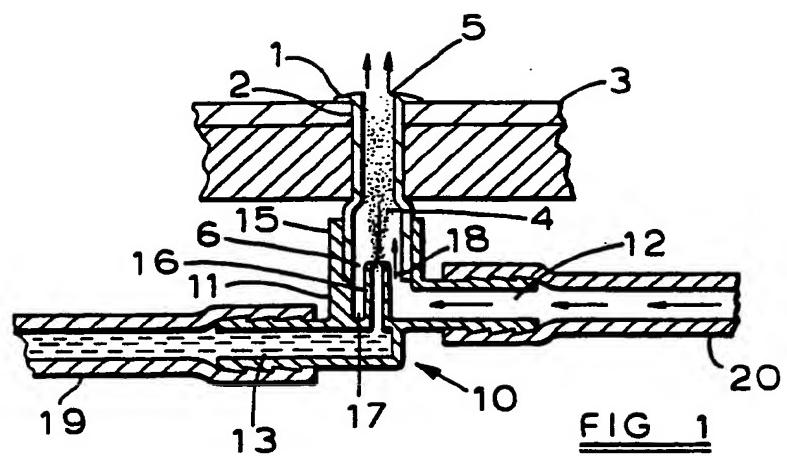


FIG 1

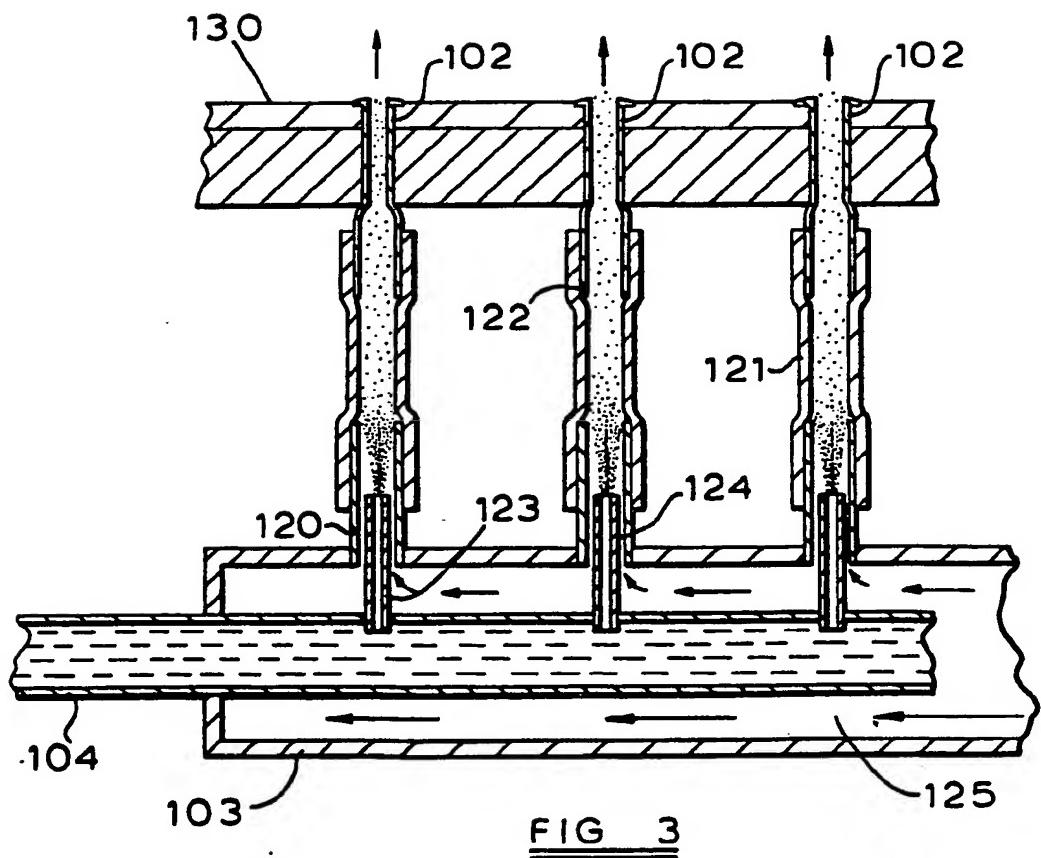
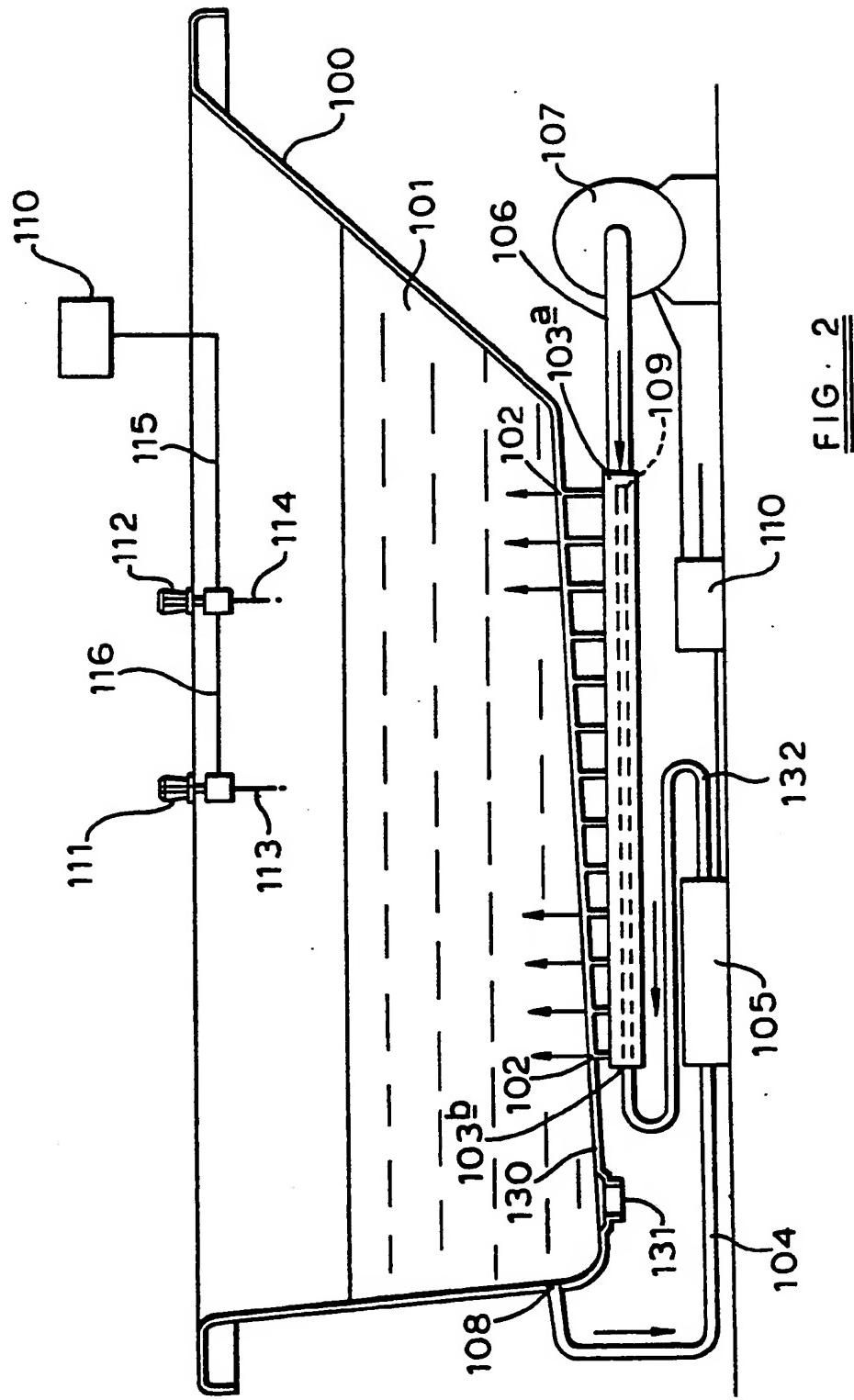
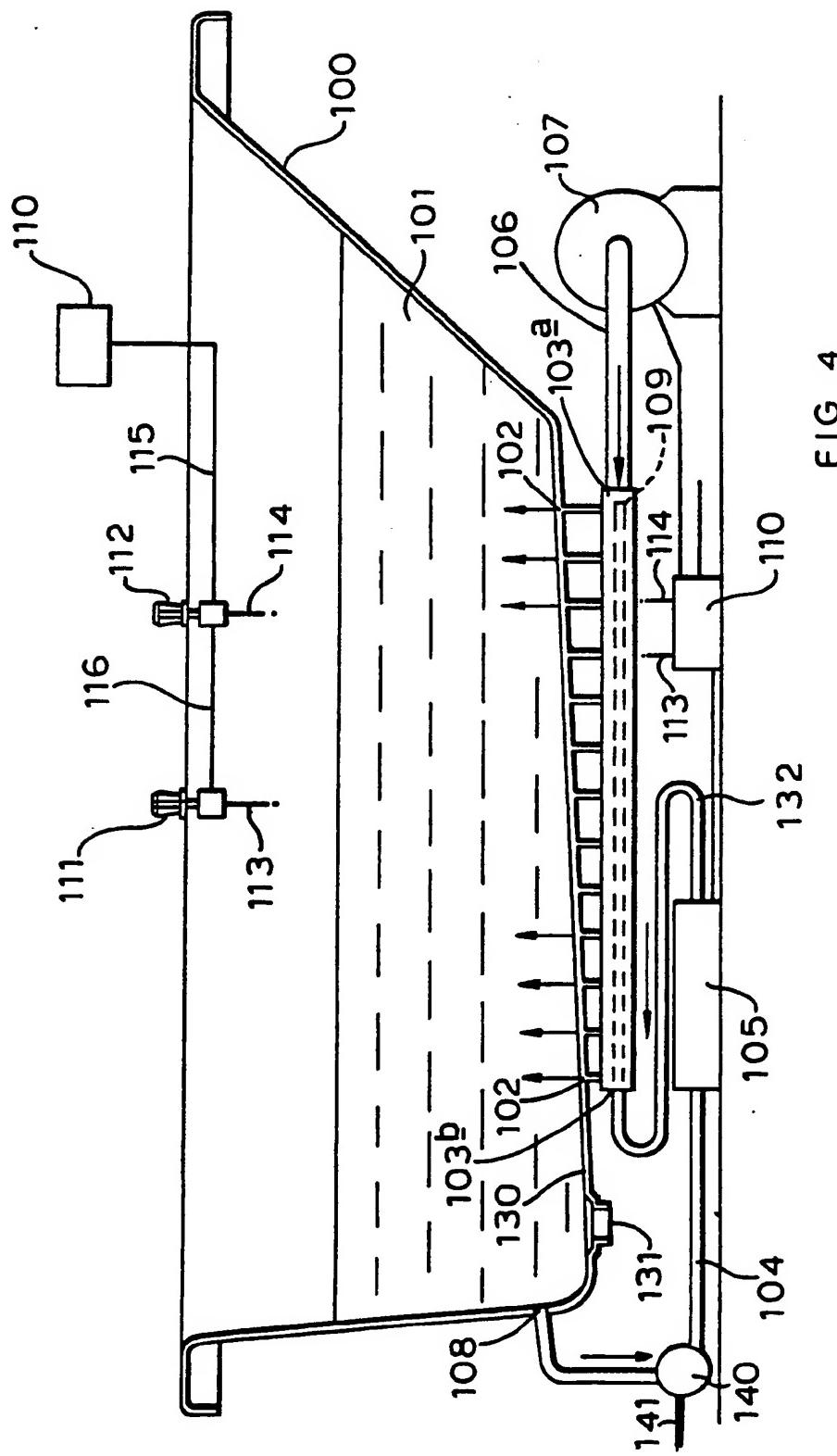


FIG 3





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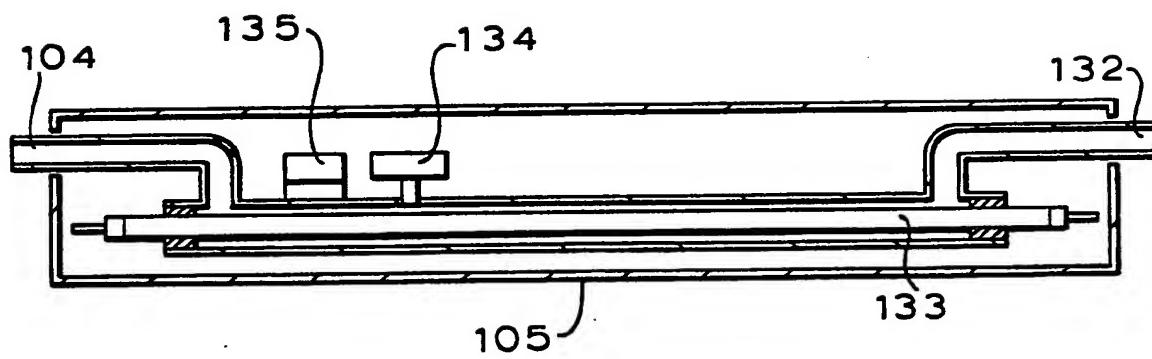


FIG 5

SPA BATHS

The present application relates to improved apparatus for injecting air/water mixtures into spa baths, that is baths in which an air/water mixture creates turbulence to give a massaging effect on the body of a user.

- 5 Commonly turbulence in spa baths is created primarily by injecting compressed air through nozzles located in the sides and/or the bottom of a bath with heated water contained in the bath. Such methods have two main defects:-
1. The rate at which the bath water cools is accelerated,
10 agitation of the water producing a substantially increased surface area of water in contact with the ambient atmosphere, and
 2. Unless heated to about 50°C, the injected air entering the bath will feel cool to a user's body close to the
15 nozzles owing to the "chill effect" caused by blown air in contact with wet skin.

I have now developed an apparatus that ameliorates these disadvantages.

In my apparatus water is taken from an outlet
20 positioned at the bottom of the bath, passed through a water heater which heats it to a temperature at or above the bath water temperature and is then directed to nozzles in the bottom,

nd or sides of the bath. Compressed air is simultaneously introduced into the nozzles in a manner that sucks up the heated water thereby resulting in an air water mixture being blown into the bath through the nozzles. The construction 5 of the nozzles is such that the heated water enters the nozzle body via a tube extending through a bore at the lower end of the body, the tube and wall of the bore defining a venturi. Compressed air is introduced into the nozzle around the bore and passing up through the venturi thereby 10 creating a vacuum which acts to suck up the water from the tube into the nozzle body and injects it in the form of fine droplets carried by the air into the bath.

Since, in my apparatus, the water is heated to a temperature at or above bath water temperature the air is 15 humidified and warmed by the atomised water, the mixture entering the bath therefore assists in maintaining the water temperature and does not feel cool to the body of user.

The air and water mixture in my apparatus will remain 20 constant for a given air flow, but the content of the mixture will be dependent upon the air volume and also upon the dimensions of the gap (venturi) between the tube introducing water into the nozzle and the walls of the nozzle bore.

Accordingly, therefore, the present invention provides a spa bath in which a water/air mixture is injected into a bath comprising:-

a bath; air/water mixture injection nozzles having 5 outlets located in at least the bottom of the bath; means adjacent the bottom of the bath for extracting water therefrom and communicating with means for supplying extracted water to the said outlets; means for supplying compressed air to the injection nozzles for mixing with 10 the said water in its passage to the said outlets; wherein there is provided heating means for heating the extracted water and wherein each of the said injection nozzles comprises; a body, having a top end in communication with an outlet in the bath;

15 a jet for receiving extracted heated water and extending into the said body to define a venturi passageway between the walls of the body and the jet;

means for providing a stream of compressed air to the bottom of the body and into the venturi passageway whereby 20 as the air accelerates through the venturi passageway it sucks up water through the said jet, forms the water into fine droplets and carries the said droplets through an outlet into the bath.

In an alternative method of using this apparatus, the water supply from the bath may be introduced to the nozzle under pressure via a pump positioned between the heater and the outlet from the bath.

5 Embodiments of the invention will now be more fully described with reference to the following drawings in which:-

- 10 Figure 1 is a diagrammatic illustration of a cross-section of a single nozzle device of the present invention located in the bottom of a bath section,
- 15 Figure 2 is a diagrammatic illustration of a section through a bath including a plurality of devices of the present invention fed by an air/water manifold, and
- Figure 3 is a diagrammatic illustration of a cross-section through a detail of the manifold and injectors along the lines AA of Figure 2.
- 20 Figure 4 is a modified version of the figure 2 representation including a bath water recirculating pump.
- Figure 5 is a diagrammatic illustration of the inline heater of figures 2 and 4.

Referring to Figure 1 - Nozzle 1 is located through hole 2 in the base 3 of a bath to form a watertight seal therebetween and has a tubular body 4, an outlet 5 and an inlet bore 6. A member, generally indicated at 10, 5 consists of a body 11 having an air inlet 12, a water inlet 13 and an outlet 15 into which the lower end of nozzle body 4 is secured in a watertight manner. A water jet 16 extends from water inlet 13 through body 11 to define an air passageway 17 between the jet and the body, the passage 10 17 being in communication with inlet 14. Said water jet 16 extends into inlet bore 6 of nozzle body 4 to define a venturi passage 18 between the jet and the walls of the bore. Heated recirculating water from the bath enters inlet 13 via supply pipe 19 and air under pressure enters 15 in 12 via supply 20.

In use, water taken from a point at or towards the bottom of a bath is passed through an inline heater and the temperature raised to, or preferably just above, bath water temperature enters member 10 from pipe 19 and inlet 13 and 20 then passes into bore 6 of nozzle 2 through jet 16. Compressed air from a blower (not shown) is directed from pipe 20 through inlet 12 and passageway 17 into the venturi gap 18 and thence into body 14 and out through outlet 5 nozzle 2. As the air passes through the venturi

gap 18 it creates a vacuum which sucks water out of jet 16 and breaks it into fine droplets which become dispersed in the air and are carried out through outlet 15 into the bath water as a dispersion in air. Because the water is heated and dispersed through the air the latter is humidified and heated thus reducing the chill factor and also reducing the rate at which the water in the bath cools.

In Figures 2, 3 and 4 - there is illustrated a bath containing a plurality of nozzles supplied with air and water via a manifold system.

In Figures 2 and 3 a bath 100 having a base 130, an outlet 131 and containing water 101, has a plurality of air/water injectors 102 secured into the base, the injectors being in communication with a manifold system 103. Manifold 103 receives water via reheated water supply pipe 122. The water is taken from an outlet 108 near the bottom of the bath to an inline heater 105 via water supply pipe 104. Air to the manifold is supplied at end 103a by inlet pipe 106 communicating with a compressor 107.

The construction of the manifold and injectors is more clearly shown in Figure 3. Manifold 103 includes upwardly directed outlets 120 concentrically aligned with the bottom portions 122 of injectors 102. The outlets 120 and bottom

of injectors 122 are coupled by a flexible means 121, all
couplings being watertight and airtight. Reheated water
supply pipe 132 having a closed end 109 enters manifold at
end 103b and is positioned concentrically of manifold 103
5 to provide a passageway 125 between the outer wall of the
pipe and the inner wall of the manifold. A plurality of
jets 123 extend upwardly from pipe 132 into outlets 120 to
provide venturi gaps 124 between the outer walls of the
jets and the inner walls of the bores. Air from the
10 compressor 107 supplied to the opposite end 103a of
manifold 103 via supply pipe 106 travels along a passageway
125 and upward through venturi gap 124 into the upper end
of outlets 120.

The temperature to which the bath water is reheated in
15 inline heater 105 and the volume of air injected from the
compressor 107 is controlled by controls 111 and 112 via
leads 113 and 114 respectively which controls are linked
electrically via lead 115 to control box 110. In order to
avoid overheating of the water by heater 105 which could
20 result in water boiling and steam being injected through
the injectors, the heater control and air control are
interlocked (116) in such manner that even if water is
available the heater will not operate unless the compressor
is also in operation. Water heater 105 illustrated in

Figure 5, includes a heating element 133, a pressure switch or a flow switch 134 to sense when water is available, a thermal cut-out 135 to prevent excessive water temperature and thermostatic or other means (not shown) to control water temperature.

In use the user will normally set the air volume and heater at the required settings prior to entering the bath. As described with reference to Figure 1, air from the compressor enters the manifold and then passes through 10 venturi passages 124 to suck water from jets 120 and to effectively atomise the water prior to the water air mixture being injected into the bath water 101 via injectors 102.

The apparatus illustrated in Figure 4 is essentially the same as that of Figure 2 with the inclusion of a recirculating pump 140 electrically linked to air control 112 via lead 141. Recirculating pump 140 is arranged to come into operation immediately air is ceased to be injected into the bath water and apparatus at a fluid flow rate irrespective of the volume of air being used or the amount of heat being added by heater 105.

As with apparatus of Figure 2 the action of the air increases the flow rate of the water as it passes through the nozzle device shown in Figure 1. The enhanced flow rate of the water, compared with that of the apparatus of Figure 2, enables the temperature of the water leaving the nozzles 102 to be thermostatically controlled at a maximum of 3°C above the temperature of the bath water.

CLAIMS

1. A spa bath in which a water/air mixture is injected into a bath comprising:-
a bath, air/water mixture injection nozzles having outlets located in at least the bottom of the bath; means adjacent the bottom of the bath for extracting water therefrom and communicating with means for supplying extracted water to the said outlets; means for supplying compressed air to the injection nozzles for mixing with the said water in its passage to the said outlets; wherein there is provided heating means for heating the extracted water and wherein each of the said injection nozzles comprises:
a body, having a top end in communication with an outlet in the bath;
15 a jet for receiving extracted heated water and extending into the said body to define a venturi passageway between the walls of the body and the jet;
means for providing a stream of compressed air to the bottom of the body and into the venturi passageway whereby as the air accelerates through the venturi passageway it sucks up water through the said jet, forms the water into fine droplets and carries the said droplets through an outlet into the bath.
- 20

2. A spa bath according to claim 1 wherein a plurality of injection nozzle bodies are contained within a manifold positioned adjacent the bottom of the bath and said extracted and heated water is provided to the jets from a supply pipe means extending into the manifold.
3. A spa bath according to claim 2 wherein the means for providing the compressed air comprises a compressor and the air is supplied to the said manifold.
4. A spa bath according to claim 1, 2 or 3 wherein control means for the heating means and compressed air supply are positioned on or adjacent a side of the bath and the said controls are arranged to provide that the heater is operative only when compressed air is provided to the injection nozzles.
5. A spa bath according to any one of claims 1 - 4 wherein the heating means includes switch means to sense when water is present in the heater.
6. A spa bath according to claim 5 wherein the switch means comprises a pressure switch or flow sense switch.
7. A spa bath according to any one of the preceding claims wherein the heating means includes a thermal cut-out.

8. A spa bath according to any one of the preceding claims where the heating means includes means to control the water temperature.
9. A spa bath according to claim 8 wherein the said control means comprises a thermostat.
10. A spa bath according to any one of the preceding claims wherein a water recirculating pump is located between the bath and the heating means for heating extracted water.
- 10 11. Apparatus according to claim 10 wherein the recirculating pump is a fixed flow pump.
12. Apparatus according to claims 10 or 11 wherein the recirculating pump is operable only when air is provided to the said injection nozzles.
- 15 13. Apparatus substantially as herein described with reference to figures 1, 2, 3 and 5 of the drawings.
14. Apparatus substantially as described herein with reference to figures 1, 3, 4 and 5 of the drawings.

